

CLAIMS

1. A liquid crystal display apparatus comprising:
  - a pair of substrates;
  - a liquid crystal arranged between said pair of the substrates;
  - a plurality of stripe electrodes per pixel formed in one of said substrates; and
  - a transparent electrode formed on the other substrate in such a manner as to cover substantially the whole surface of said other substrate.
2. A liquid crystal display apparatus according to claim 1, wherein all of the plurality of stripe electrodes are supplied with the same voltage.
3. A liquid crystal display apparatus according to claim 1, wherein said stripe electrodes comprise first and second groups of stripe electrodes parallel to each other, the first group of stripe electrodes are supplied with a first voltage and the second group of stripe electrodes are supplied with a second voltage different from the first voltage.
4. A liquid crystal display apparatus according to claim 3, wherein the first group of stripe electrodes are supplied with a data voltage and the second group of stripe electrodes are supplied with a different voltage.
5. A liquid crystal display apparatus according to claim 1, wherein said liquid crystal has a positive dielectric anisotropy and the initial alignment thereof when no voltage applied thereto is a vertical alignment.
6. A liquid crystal display apparatus according to claim 1, further comprising a dielectric layer between the transparent electrode and the liquid crystal layer.
7. A liquid crystal display apparatus according to claim 6, wherein the dielectric layer is formed in contact with the transparent layer and an alignment layer is formed on said dielectric layer for causing the liquid crystal to be aligned.
8. A liquid crystal display apparatus according to

claim 6, wherein said dielectric layer is formed of a color filter layer.

9. A liquid crystal display apparatus according to claim 6, wherein said dielectric layer is adapted for  
5 alignment.

10. A liquid crystal display apparatus according to claim 1, wherein the initial alignment of the liquid crystal is a vertical alignment and a liquid crystal panel including said pair of the substrates is arranged between crossed Nicol polarizers.  
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11. A liquid crystal display apparatus according to claim 10, wherein said stripe electrodes include first and second groups of stripe electrodes, the first group of stripe electrodes have parallel linear portions, the second group of stripe electrodes have parallel linear portions, and the linear portions of the first group of stripe electrodes are parallel to the linear portions of the second group of stripe electrodes.  
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12. A liquid crystal display apparatus according to claim 1, further comprising a pair of polarizers having axes at right angles to each other and arranged on either side of a liquid crystal panel including said pair of substrates, and at least one phase layer is arranged between at least one of the polarizers and the liquid crystal panel.  
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13. A liquid crystal display apparatus according to claim 12, wherein the initial alignment of the liquid crystal of the liquid crystal panel is a vertical alignment, and the relation holds that

30       $n_x \geq n_z, n_y \geq n_z$  (not  $n_x = n_y = n_z$ )      (1)

where  $n_x, n_y, n_z$  are main refractive indexes of the phase layer, in which  $n_x, n_y$  are taken in a plane of the phase layer,  $n_z$  is taken normal to the phase layer,  $n_x$  is taken perpendicular to an absorption axis of the adjacent polarizer, and  $n_y$  is taken parallel to the absorption axis of the adjacent polarizer.  
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14. A liquid crystal display apparatus according to

claim 12, wherein N phase layers are provided in which the initial alignment of the liquid crystal of the liquid crystal panel is a vertical alignment, and the relation holds that

$$n_x \geq n_z, \quad n_y \geq n_z \quad (\text{not } n_x = n_y = n_z) \quad (1)$$

where  $n_x$ ,  $n_y$ ,  $n_z$  are main refractive indexes of the phase layers, in which  $n_x$ ,  $n_y$  are taken in a plane of the phase layer,  $n_z$  is taken normal to the phase layer,  $n_x$  is taken perpendicular to an absorption axis of the adjacent polarizer, and  $n_y$  is taken parallel to the absorption axis of the adjacent polarizer, and

wherein the following phases are satisfied at the same time

$$-130 \text{ nm} \leq R_1 \leq 230 \text{ nm} \quad (2)$$

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$$-130 \text{ nm} \leq R_N \leq 230 \text{ nm}$$

$$R_{t1} + R_{t2} + \dots + R_{tN} \leq 1.6 \times R_{LC} \quad (3)$$

where  $d$  is the thickness of the phase layers,  $\Delta n_{LC}$  of the liquid crystal panel is  $R_{LC}$ ,  $R = (n_x - n_y)d$ ,  $R_t = ((n_x + n_y)/2 - n_z)d$ ,  $R$  of the  $N$  phase layers is  $R_1, R_2, \dots, R_N$ , and  $R_t$  is  $R_{t1}, R_{t2}, \dots, R_{tN}$ .

15. A liquid crystal display apparatus according to  
claim 12, wherein N phase layers are provided in which  
the initial alignment of the liquid crystal of the liquid  
crystal panel is a vertical alignment, and the relation  
holds that

$$n_x \geq n_z, \quad n_y \geq n_z \quad (\text{not } n_x = n_y = n_z) \quad (1)$$

where  $n_x$ ,  $n_y$ ,  $n_z$  are main refractive indexes of the phase layers, in which  $n_x$ ,  $n_y$  are taken in a plane of the phase layers,  $n_z$  is taken normal to the phase layers,  $n_x$  is taken perpendicular to an absorption axis of the adjacent polarizer, and  $n_y$  is taken parallel to the absorption axis of the adjacent polarizer, and

wherein the following phases are satisfied at the same time

$$-50 \text{ nm} \leq R_1 \leq 150 \text{ nm} \quad (4)$$

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$$-50 \text{ nm} \leq R_N \leq 150 \text{ nm}$$

$$R_{t1} + R_{t2} + \dots + R_{tN} \leq 1.3 \times R_{LC} \quad (5)$$

where  $d$  is the thickness of the phase layers,  $\Delta n d_{LC}$  of  
5 the liquid crystal panel is  $R_{LC}$ ,  $R = (n_x - n_y)d$ ,  $R_t = ((n_x + n_y)/2 - n_z)d$ ,  $R$  of the  $N$  phase layers is  $R_1, R_2, \dots, R_N$ , and  $R_t$  is  $R_{t1}, R_{t2}, \dots, R_{tN}$ .

16. A liquid crystal display apparatus comprising:  
10                   a pair of substrates;  
                  a liquid crystal arranged between said pair of the substrates;  
                  a plurality of stripe electrodes and an alignment layer formed in one of said substrates;  
                  an alignment layer formed in the other 15 substrate;  
                  said stripe electrodes including first and second groups of stripe electrodes parallel to each other, the first group of the stripe electrodes being supplied with a first voltage, and the second group of stripe electrodes being supplied with a second voltage different from the first voltage; and  
20                   an insulating layer covering at least one of the first and second groups of stripe electrodes and arranged under the alignment layer.  
25. A liquid crystal display apparatus according to claim 16, wherein a volume resistivity of the insulating layer is larger than a volume resistivity of the alignment layer.  
18. A liquid crystal display apparatus comprising:  
30                   a pair of substrates;  
                  a liquid crystal arranged between said pair of the substrates;  
                  a plurality of stripe electrodes and an alignment layer formed in one of said substrates;  
                  an alignment layer formed in the other 35 substrate;

5                    said stripe electrodes including first and second groups of stripe electrodes parallel to each other, the first group of stripe electrodes being supplied with a first voltage, and the second group of stripe electrodes being supplied with a second voltage different from the first voltage; and

10                  each of the stripe electrodes of the first and second groups located in one region having a shape aligned in one direction, each of the stripe electrodes of the first and second groups located in another region having the same shape as the stripe electrodes of said first and second groups located in said one region but aligned in the direction opposite to said one direction.

15                  19. A liquid crystal display apparatus according to claim 18, wherein said one region and said another region are arranged alternately.

20                  20. A liquid crystal display apparatus comprising:

                      a pair of substrates;

25                 a liquid crystal arranged between said pair of substrates;

                      a plurality of stripe electrodes and an alignment layer formed in one of said substrates;

                      an alignment layer formed in the other substrate;

25                 25. said stripe electrodes including first and second groups of stripe electrodes parallel to each other, the first group of stripe electrodes being supplied with a first voltage, and the second group of stripe electrodes being supplied with a second voltage different from the first voltage; and

30                 30. a plurality of pixels, each pixel having a peripheral portion, a first connection electrode arranged at the peripheral portion of said pixel for connecting the first group of stripe electrodes together, and a second connection electrode arranged at the peripheral portion of the pixel for connecting the second group of stripe electrodes together, the first connection

electrode at least partially overlapping the second connection electrode through an insulating layer.

21. A liquid crystal display apparatus according to claim 16, 18 or 20, wherein the first group of stripe electrodes include a first subgroup of parallel linear portions and a second subgroup of parallel linear portions arranged at an angle to the first subgroup of linear portions, and the second group of stripe electrodes include a third subgroup of parallel linear portions and a fourth subgroup of parallel linear portions arranged at an angle to the third subgroup of the linear portions, the first and second subgroups of linear portions and the third and fourth subgroups of linear portions being arranged at angle of 2 to 88 degrees to the data bus lines.

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22. A liquid crystal display apparatus according to claim 16, 18 or 20, further comprising a transparent electrode formed in said other substrate in such a manner as to cover substantially the whole surface of said other substrate.

23. A liquid crystal display apparatus comprising:

a pair of substrates;

a liquid crystal arranged between said pair of substrates;

a plurality of stripe electrodes and an alignment layer formed in one of said substrates;

an alignment layer formed in the other substrate;

gate bus lines, data bus lines and TFTs arranged in said one substrate;

said stripe electrodes including first and second groups of stripe electrodes parallel to each other, the first group of stripe electrodes being supplied with a first voltage, and the second group of stripe electrodes being supplied with a second voltage different from the first voltage;

a plurality of pixels, each pixel having a

5        peripheral portion, a first connection electrode arranged at the peripheral portion of the pixel for connecting the first group of stripe electrodes together, and a second connection electrode arranged at the peripheral portion of the pixel for connecting the second group of stripe electrodes together, the first connection electrode at least partially overlapping the second connection electrode through an insulating layer; and

10      a driving correction electrode portion crossing one stripe electrode of said first or second groups at right or acute angle thereto, said driving correction electrode portion being connected to one stripe electrode of the group different from the group including said first one stripe electrode and arranged in 15      the same layer as said first or second connection electrode for said one stripe electrode of said different group.

20      24. A liquid crystal display apparatus according to claim 23, wherein the first group of stripe electrodes include a first subgroup of parallel linear portions and a second subgroup of parallel linear portions arranged at an angle to the first subgroup of the linear portions, and the second group of the stripe electrodes include a third subgroup of parallel linear portions and a fourth subgroup of parallel linear portions arranged at an angle to the third subgroup of the linear portions, the first 25      and second subgroups of linear portions and the third and fourth subgroups of linear portions being arranged at an angle of 2 to 88 degrees to the data bus lines;

30      wherein said one substrate further comprises gate bus lines, data bus lines and TFTs, the first group of the stripe electrodes being connected to the TFT; and

35      wherein in one pixel, said first connection electrode includes a plurality of connection electrode portions connecting the first and second subgroups of linear portions together, and

discontinuously extending in parallel to the data bus lines at the peripheral portion of the pixel for connecting the ends of at least two linear portions of said first and second subgroups to each other, and said second connection electrode interconnects said third and fourth subgroups of the linear portions together.

5           25. A liquid crystal display apparatus according to claim 23, further comprising gate bus lines, data bus lines and TFTs, the first group of the stripe electrodes being connected to the TFTs,

10           wherein one of the stripe electrodes of the first group are connected to a portion of the first connection electrode parallel to the data bus lines, said portion of said first connection electrode extends in one direction from the joint between said one stripe electrode and said portion of said first connection electrode, and said driving correction electrode portion extends in parallel to said data bus lines in the direction opposite to said portion of the connection electrode and ends at a position overlapping the nearest one of the stripe electrodes of the second group.

15           26. A liquid crystal display apparatus according to claim 23, wherein one of the stripe electrodes of the second group is connected to a portion of the second connection electrode parallel to the gate bus lines, and said driving correction electrode portion is connected to the inner side of said portion of said second connection electrode.

20           27. A liquid crystal display apparatus according to claim 23, wherein said driving correction electrode portion is formed in such a manner that said first connection electrode is depressed so that said second connection electrode protrudes from said first connection electrode.

25           28. A liquid crystal display apparatus according to claim 23, wherein said driving correction electrode portion is in the same layer as one of the overlapping

portions of the first and second connection electrodes, and said driving correction electrode portion protrudes inward from the other of the overlapping portions of said first and second the connection electrodes.

5       29. A liquid crystal display apparatus comprising:  
                a pair of substrates;  
                a liquid crystal arranged between said  
pair of substrates;

10      alignment layer formed in one of said substrates;  
                an alignment layer formed on the other  
substrate; and

15      said stripe electrodes including first and  
second groups of stripe electrodes parallel to each  
other, the first group of the stripe electrodes being  
supplied with a first voltage, and the second group of  
stripe electrodes being supplied with a second voltage  
different from the first voltage;

20      an insulating layer formed in said one  
substrate under the alignment layer to cover the first  
and second groups of stripe electrodes, said insulating  
layer being partially removed in the vicinity of at least  
one of the first and second groups of stripe electrodes.

30      30. A liquid crystal display apparatus comprising:

25      a pair of substrates;  
                a liquid crystal arranged between said  
pair of substrates;

30      a plurality of stripe electrodes and an  
alignment layer formed in one of said substrates;

35      a transparent electrode covering  
substantially the whole surface of the other substrate  
and an alignment layer formed in the other substrate;

35      said stripe electrodes including first and  
second groups of stripe electrodes parallel to each  
other, the first group of stripe electrodes being  
supplied with a first voltage and the second group of  
stripe electrodes being supplied with a second voltage

different from the first voltage; and  
said transparent electrode having a region  
of high resistance and a region of low resistance.

31. A liquid crystal display apparatus comprising:

5 a pair of substrates;

a liquid crystal arranged between said  
pair of the substrates;

a plurality of stripe electrodes and an  
alignment layer formed in one of said substrates;

10 a transparent electrode covering

substantially the whole surface of the other substrate  
and an alignment layer formed in the other substrate;

a sealed liquid injection hole; and

15 a dielectric layer inserted between said  
transparent electrode and said liquid crystal layer, a  
region of said dielectric layer in the vicinity of a side  
of the liquid crystal display apparatus far from the  
liquid crystal injection hole being partially removed.

32. A liquid crystal display apparatus comprising:

20 a pair of substrates;

a liquid crystal arranged between said  
pair of substrates;

a plurality of stripe electrodes and an  
alignment layer formed in one of said substrates;

25 a transparent electrode covering

substantially the whole surface of the other substrate  
and an alignment layer formed in said other substrate;

a sealed liquid injection hole; and

30 an insulating layer formed in said one  
substrate under said alignment layer to cover said stripe  
electrodes, a region of said insulating layer in the  
vicinity of a side of the liquid crystal display  
apparatus far from the liquid crystal injection hole  
being partially removed.

35 33. A liquid crystal display apparatus comprising:

a pair of substrates;

a liquid crystal arranged between said

pair of substrates;

a plurality of stripe electrodes, TFTs and an alignment layer formed in one of said substrates;

an alignment layer formed in the other substrate;

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said stripe electrodes including first and second groups of electrodes, the first group of electrodes being supplied with a first voltage, the second group of electrodes being supplied with a second voltage different from the first voltage; and

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a plurality of pixels, each pixel having a peripheral portion, a first connection electrode arranged at the peripheral portion of said pixel for connecting the first group of stripe electrodes together, and a second connection electrode arranged at the peripheral portion of said pixel for connecting the second group of stripe electrodes together, said first connection electrode being connected to the TFT, said second connection electrode being connected to a second connection electrode of an adjacent pixel by a plurality of common bus lines.

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34. A liquid crystal display apparatus comprising:

a pair of substrates;

a liquid crystal arranged between said

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pair of substrates;

a plurality of stripe electrodes and an alignment layer formed in one of said substrates;

an alignment layer formed in the other substrate;

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said stripe electrodes including first and second groups of stripe electrodes parallel to each other, the first group of the stripe electrodes being supplied with a first voltage, the second group of the stripe electrodes being supplied with a second voltage different from the first voltage;

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said one substrate further including gate bus lines, data bus lines crossing said gate bus lines

and TFTs; and

5                   a gate electrode of said thin film transistor being electrically connected to the nth gate bus line, a drain electrode of said thin film transistor being electrically connected to the mth data bus line, a source electrode of said thin film transistor being electrically connected to one of the stripe electrodes of said first group, one of the stripe electrodes of said second group being electrically connected to the (n+1)th gate bus line.

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15                 35. A liquid crystal display apparatus according to claim 34, wherein said first and second groups of the stripe electrodes are arranged in parallel to the data bus lines, and said second group of the stripe electrodes partially overlap the data bus lines.

20                 36. A liquid crystal display apparatus according to claim 34, wherein said gate bus lines are supplied, at selected timings, with a reference voltage for determining a voltage of said second group of the stripe electrodes at the time of writing display data, a first voltage for turning said TFT on and a second voltage for turning TFT off.

25                 37. A liquid crystal display apparatus according to claim 36, wherein when writing display data to a pixel connected to the nth gate bus line, said nth gate bus line is set to said first voltage, said (n+1)th gate bus line is set to said reference voltage, and the other gate bus lines are set to said second voltage.

30                 38. A liquid crystal display apparatus comprising:  
                      a pair of substrates;  
                      a liquid crystal arranged between said pair of substrates;  
                      a plurality of stripe electrodes and an alignment layer formed in one of said substrates;  
35                 an alignment layer formed in the other substrate;  
                      said stripe electrodes including first and

second groups of stripe electrodes parallel to each other, the first group of stripe electrodes being supplied with a first voltage, the second group of stripe electrodes being supplied with a second voltage different  
5 from the first voltage;

said one substrate further including gate bus lines, data bus lines crossing said gate bus lines, and first TFTs and second TFTs;

10 a gate electrode of said first TFT being electrically connected to the nth gate bus line, a drain electrode of said first TFT being electrically connected to the mth data bus line, a source electrode of said first TFT being electrically connected to one of the stripe electrodes of said first group; and

15 a gate electrode of said second TFT being electrically connected to the nth gate bus line, a drain electrode of said second TFT being electrically connected to the (n+1)th gate bus line, a source electrode of said second TFT being electrically connected to one of the stripe electrodes of said second group.

39. A liquid crystal display apparatus according to claim 38, wherein said first TFT and said second TFT have a common gate electrode.

40. A liquid crystal display apparatus according to  
25 claim 38, wherein said gate bus lines are supplied, at selected timings, with a reference voltage for determining a voltage of said second group of the stripe electrodes at the time of writing display data, a first voltage for turning said first TFT and said second TFT on, and a second voltage for turning said first TFT and said second TFT off.

30 41. A liquid crystal display apparatus according to claim 40, wherein, when writing display data to the pixel connected to the nth gate bus line, said nth gate bus line is set to said first voltage, said (n+1)th gate bus line is set to said reference voltage, and the other gate bus lines are set to said second voltage.

42. A liquid crystal display apparatus comprising:

a pair of substrates;

a liquid crystal inserted between said pair of substrates;

5 an electrode and an alignment layer formed in one of said substrates;

an alignment layer formed in the other substrate;

10 said one substrate further including gate bus lines, data bus lines crossing said gate bus lines and TFTs;

15 said other substrate including a black matrix for shielding pixel regions from each other and a color filter with color filter components for determining color of the transmitted light for each pixel region;

a plurality of pixels; and

20 said color filter component extending from one pixel region to the adjacent pixel region beyond said black matrix, said black matrix being covered by at least two color filter components, a width of the overlapping portion of said two color filter components being larger than a width of said black matrix.

43. A liquid crystal display apparatus comprising:

a pair of substrates;

25 a liquid crystal inserted between said pair of substrates;

an electrode and an alignment layer formed in one of said substrates;

30 an alignment layer formed in the other substrate;

said alignment layer of said one substrate being formed to cover said electrode; and

35 said alignment layer of said other substrate having electrical characteristics different from those of said alignment layer of said one substrate.

44. A liquid crystal display apparatus according to claim 43, wherein a volume resistivity of said alignment

layer of said one substrate is smaller than a volume resistivity of said alignment layer of said other substrate.

5       45. A liquid crystal display apparatus according to claim 44, wherein a volume resistivity of said liquid crystal is closer to the volume resistivity of the alignment layer of said one substrate than to the volume resistivity of said alignment layer of said other substrate.

10      46. A liquid crystal display apparatus comprising:  
                  a pair of substrates;  
                  a liquid crystal inserted between said pair of substrates;  
                  first and second electrodes and an  
15     alignment layer covering said first and second electrodes formed in one of said substrates;  
                  an alignment layer formed in said other substrate;  
                  said first and second electrodes being  
20     supplied with mutually different voltages so that an electric field may be formed between said first and second electrodes; and  
                  a chiral agent added to said liquid crystal.

25      47. A liquid crystal display apparatus according to claim 46, wherein one of said alignment layer of said one substrate and said alignment layer of said other substrate is a horizontal alignment layer, and the other alignment layer is a vertical alignment layer.

30      48. A liquid crystal display apparatus according to claim 47, wherein the direction of alignment of said horizontal alignment layer is parallel to the direction of the electric field generated between said first electrode and said second electrode.

35      49. A liquid crystal display apparatus according to claim 46, wherein the ratio d/p between the thickness d of the liquid crystal layer and the natural twist pitch p

of said liquid crystal is 0.125 to 3.

5        50. A liquid crystal display apparatus according to claim 46, wherein the product  $\Delta n d$  of the double refractive index  $\Delta n$  of said liquid crystal and the thickness  $d$  of the liquid crystal layer is in the range of  $0.7 \pm 0.2$ .

10      51. A liquid crystal display apparatus according to claim 47, wherein each pixel includes therein a plurality of regions where said horizontal alignment layer is treated to provide alignments in different directions.

15      52. A liquid crystal display panel comprising:  
                an optically transparent first substrate;  
                a second substrate arranged in opposed relation to said first substrate;  
                a liquid crystal inserted between said first substrate and said second substrate;  
                said first substrate having an alignment layer;  
                said second substrate having a reflection layer, first and second stripe electrodes parallel to each other and an alignment layer; and  
                said first stripe electrode being located substantially at the center of a pixel, said second stripe electrode being arranged at the boundary between adjacent two pixels, said first and second stripe electrodes being adapted to generate an electric field therebetween.

20      53. A liquid crystal display panel comprising:  
                an optically transparent first substrate;  
                a second substrate arranged in opposed relation to said first substrate;  
                a liquid crystal inserted between said first substrate and said second substrate;  
                said first substrate having first stripe electrodes and an alignment layer;  
                said second substrate having a reflection

layer, second stripe electrodes parallel to said first stripe electrodes and an alignment layer; and

5                 said first stripe electrode being located substantially at the center of a pixel, said second stripe electrode being arranged at the boundary between adjacent two pixels, said first and second stripe electrodes being adapted to generate an electric field therebetween.

54. A liquid crystal display panel comprising:

10                 an optically transparent first substrate;  
                       a second substrate arranged in opposed relation to said first substrate;

                       a liquid crystal inserted between said first substrate and said second substrate;

15                 said first substrate having first and second stripe electrodes parallel to each other and an alignment layer;

                       said second substrate having a reflection layer and an alignment layer; and

20                 said first stripe electrode being located substantially at the center of a pixel, said second stripe electrode being arranged at the boundary between adjacent two pixels, said first and second stripe electrodes being adapted to generate an electric field therebetween.

55. A liquid crystal display panel comprising:

                       an optically transparent first substrate;  
                       a second substrate arranged in opposed relation to said first substrate;

30                 a liquid crystal inserted between said first substrate and said second substrate;

                       said first substrate having first and second stripe electrodes parallel to each other and an alignment layer;

35                 said second substrate having a reflection layer, third and fourth electrodes parallel to each other and extending in such a direction as to cross said first

and second stripe electrodes, and an alignment layer;  
said first stripe electrode being located substantially at the center of a pixel, said second stripe electrodes being arranged at the boundary between adjacent two pixels, said first and second stripe electrodes being adapted to generate an electric field therebetween; and

5                   said third stripe electrode being located substantially at the center of a pixel, said fourth stripe electrode being arranged at the boundary between adjacent two pixels, said third and fourth stripe electrodes being adapted to generate an electric field between said first and second stripe electrodes.

10                 56. A liquid crystal display panel comprising:  
an optically transparent first substrate;

15                 a second substrate arranged in opposed relation to said first substrate;

20                 a guest-host liquid crystal inserted between said first substrate and said second substrate;

25                 said first substrate having an alignment layer;

25                 said second substrate having a reflection layer, an insulating layer functioning as a 1/4 wavelength plate, first and second parallel stripe electrodes and an alignment layer; and

30                 said first stripe electrodes being located substantially at the center of a pixel, said second stripe electrodes being arranged at the boundary between adjacent two pixels, said first and second stripe electrodes being adapted to generate an electric field therebetween.

35                 57. A liquid crystal display apparatus comprising:  
a pair of substrates;

35                 a liquid crystal arranged between said pair of substrates;

                    a plurality of stripe electrodes per pixel and an alignment layer formed in one of said substrates;

a transparent electrode covering substantially the whole surface of the other substrate and an alignment layer formed in the other substrate;

5 a dielectric layer arranged in said other substrate between said transparent electrode and said liquid crystal layer; and

10 said dielectric layer having a surface formed in a curved shape such that a normal vector at a point on the surface of said dielectric layer is closer to a line which is parallel to an electric line of force penetrating that point than that when said dielectric layer has a surface formed in a planar shape.

58. A liquid crystal display apparatus comprising:

15 pair of substrates;

pair of substrates;

a plurality of stripe electrodes per pixel and an alignment layer formed in one of said substrates;

20 a transparent electrode covering substantially the whole surface of the other substrate and an alignment layer formed in the other substrate;

an insulating layer arranged in said one substrate to cover said stripe electrodes; and

25 said insulating layer having openings above said stripe electrodes, said openings having tapered side walls.

59. A liquid crystal display apparatus comprising:

a pair of substrates;

30 pair of substrates;

a plurality of stripe electrodes per pixel and an alignment layer formed in one of said substrates;

35 a transparent electrode covering substantially the whole surface of the other substrate and an alignment layer formed in the other substrate;

a dielectric layer arranged in said other substrate between said transparent electrode and said

liquid crystal layer; and

said dielectric layer satisfying a relationship of  $0.5 < d/\epsilon$ , where d is the thickness of a dielectric layer, and  $\epsilon$  is a relative dielectric constant.

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60. A liquid crystal display apparatus according to claim 59, wherein said dielectric layer satisfies a relationship of  $0.5 < d/\epsilon < 0.9$ .

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61. A liquid crystal display apparatus comprising:  
a pair of substrates;  
a liquid crystal arranged between said pair of substrates;

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a plurality of stripe electrodes per pixel and an alignment layer formed in one of said substrates;  
a transparent electrode covering substantially the whole surface of the other substrate and an alignment layer formed in the other substrate;

20

a dielectric layer arranged in said other substrate between said transparent electrode and said liquid crystal layer; and

said dielectric layer comprising a color filter layer and a transparent resin layer.

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62. A liquid crystal display apparatus according to claim 61, wherein a thickness of said transparent resin layer is greater than that of said color filter layer.

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63. A liquid crystal display apparatus comprising:  
a pair of substrates;  
a liquid crystal arranged between said pair of substrates;

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a plurality of stripe electrodes per pixel and an alignment layer formed in one of said substrates;  
a transparent electrode covering substantially the whole surface of the other substrate and an alignment layer formed in the other substrate;  
a dielectric layer arranged in said other substrate between said transparent electrode and said

liquid crystal layer; and  
said dielectric layer having an optical  
anisotropy.

64. A liquid crystal display apparatus according to  
5 claim 63, wherein said dielectric layer comprises a major  
dielectric layer and an alignment layer to cause said  
major dielectric layer to be aligned, said major  
dielectric material being applied onto said alignment  
layer and aligned, and being cured by irradiation of  
10 light or heating.